What is claimed is:

1. A photon welding apparatus comprising;

a non-coherent photon source;

a light pipe coupled to the photon source at one end with a thin mask at the other end that defines the weld location for photon delivery;

a work piece to be bonded that consists of a top layer of transparent plastic and a base layer of absorbing plastic;

a mask consisting of a reflective coating on the end of the light pipe on all surfaces not in contact with the work piece;

a means of applying a controlled, compressive force to the work piece during the weld and a short time thereafter;

a means of maintaining the alignment of the light pipe, top layer of the work piece, and base layer of the work piece during the bonding cycle.

2. The apparatus of Claim 1 where the light pipe or thin mask is comprised of silicon dioxide, glass or other suitable materials.

3. The apparatus of Claim 1 where the photon source is a quartz halogen tungsten lamp or other suitable light sources.

4. The apparatus of Claim 1 where reflectors are used to couple the photon source to the light pipe.

5. The apparatus of Claim 1 where the power level to the photon source and the welding time interval are controlled.

6. The apparatus of Claim 1 where cooling means are employed to reduce the welding cycle time.

7. The apparatus of Claim 1 where the components to be welded are carried in a nest and the following sequence of automated steps occurs: the nested components move into the welding position, a light pipe with mask contacts the transmissive layer of the work piece, a compression force is applied to the work piece, the radiation source is activated for a prescribed interval, cooling means are activated when required, after an appropriate delay period the compressive force is removed, the welded work piece is withdrawn from contact with the light pipe, and the work piece is removed from the nest.

8. An automation photon welding apparatus comprising:

a mechanism to load and unload unwelded components onto a conveyor or belt-driven system;

a system to pre-heat the components to be welded;

a welding apparatus built within the principles introduced by the invention;

a mechanism to align the components to the masked light pipe;

an integrated control device to automatically and easily change parameters such as weld time exposure, force applied to components, belt speed, pre-heat temperature, and cooling if so desired by the operator; and

a combination of pneumatic pistons and optical sensors to control, move, measure, and align components to be welded.

9. A photon welding method comprising:

a photon source;

a light pipe coupled to the photon source at one end a raised section at the other end that defines the weld location for photon delivery;

a work piece to be bonded that consists of a top layer of transparent plastic and a base layer of absorbing plastic;

a mask consisting of a reflective coating on the end of the light pipe on all surfaces not in contact with the work piece;

a means of applying a controlled, compressive force to the work piece during the weld and a short time thereafter;

a means of maintaining the alignment of the light pipe, top layer of the work piece, and

base layer of the work piece during the bonding cycle.

10. A photon welding apparatus, for joining one part that is highly photon absorbing to the other part that is highly photon transmissive, that comprises a non-coherent photon source which is held in place by a structural support which connects the non-coherent photon source system to the base by means of a structural support; and further comprises a movable plate which is designed to move components to the mask end of the light pipe and to apply pressure to the components to be welded where pressure is applied by at least one of the following: levers, cams, pistons, linear actuators, springs or any other means that produce the same effect; and further comprises a means to make the light source uniformly dispersed over the open areas of the mask to initially simultaneously irradiate the highly absorbing component which in turn conducts heat to the transparent component when held under pressure; and further a means to assist in the alignment of the components; and further a means to cool the light pipe, masks and reflector; and further a nest to align the parts where the nest is connected to the movable plate; and further comprising timing means which times the radiation exposure, as well as the full cycle including post exposure hold and cooling.

11. An apparatus as in claim 10, further comprising a means to apply even pressure to the parts where such means shall be selected from the group: set of springs, universal ball joint, floating pneumatic system, and floating hydraulic system.

12. An apparatus as in claim 10, which further comprises multiple nests connected to the movable plate and further5 comprising a mask and non-coherent photon source for each part.

13. An apparatus as in claim 10, except it comprises a movable means that is connected to the light pipe and moves it to contact the fixed base where the nest and components are located.

14. An apparatus as claimed in 10 that further comprises a means to monitor temperature selected from the group of; light pipe, mask, components, and reflector.

15. A semi-automated photon welding apparatus that comprises a non-coherent photon source with a photon collection system such as a reflector; and further comprises a means to hold the photon sources fixed in place by a structural support, which connects the non-coherent photon source to the base by means of structural support; and further comprises a conveyor belt system to feed and load the components to be welded, which also contains a pallet with one or more nests; the conveyor moves the components into position, aligns them and lock the pallet, then one or more mechanical means such as a piston fitted with a universal joint and thus applies pressure to the components to be welded by bring them in contact with the mask and holding the components under pressure; and further comprises a means to make the light uniformly dispersed over at least the open area of the mask so that it simultaneously and uniformly heats up the highly absorptive component(s) first and which conducts the heat to the transparent component and heats it to melting at the interface only such that a strong weld is accomplished and these components are held under pressure by some mechanical means including at least one selected from the following group: piston, linear actuator, levers, cams or any other means to produce the same effect; and further comprises a means to cool the light pipe and/or mask and a means to cool the reflector of the non-coherent source; and further comprises a nest to hold and align at least two components where the lower component is highly absorbent of at least a major portion of the photons from the non-coherent source and the top component is highly transmissive of the photons; and further comprising a nest that is part of the pallet; and further comprises a timing means, which times the radiation

exposure (lamp on time) and each phase of the full cycle including post exposure hold to assure a quality weld and cooling of the lens and/or light pipe.

16. An apparatus as claimed in claim 15 further comprising a means to apply even pressure to the components to be welded such means may be selected from the group: 1) set of springs, 2) universal ball joint, 3) Floating pneumatic and 4) floating hydraulic.

17. An apparatus as claimed in claim 16 that further comprises multiple nests each aligned with a photon source and the nest are connected to one movable plate and further comprises multiple masks that work in unison such that parts are welded at the same time.

18. An apparatus as claimed in claim 15 that comprises a means to measure temperature at one or more of the following locations: 1) light pipe, 2) reflector, and 3) mask.